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that are proposed. There is not this opportunity in science, although science is fundamental.

The relative absence of scientific men from the House of Commons is both a cause and a symptom of the neglect of science in this country. The majority of members of parliament fall into two classes. One of these consists chiefly of representatives of the great working-class organizations, whose subscriptions supply the necessary funds for contesting elections, and whose membership gives the requisite electoral backing. Even if a similar combination were to be desired in the case of scientific workers—an extremely doubtful proposition—their numbers are too few to make it effective. The other great class consists chiefly of persons who have inherited or acquired a competence, and who have the money and the leisure to woo an electorate. As matters are arranged at present, it is almost impossible for a man who devotes his life to scientific research to acquire a competence. His life is spent between the laboratory and the lecture-room amid gray suburban or provincial surroundings, with possibly a small retiring pension. He must be content, and for the most part he is content, with the high adventures of thought and with the appreciation of his fellows. We suggest that this compulsory segregation is bad for scientific researchers and worse for the nation.—*London Times*.

#### SCIENTIFIC BOOKS

*Contributions to Embryology*. Published by the Carnegie Institution of Washington. No. 1, 1915; No. 26, 1918. Volumes 1-8.

Every American embryologist who does not indulge in envy may pardonably take pride in the *Contributions to Embryology* issued by the Carnegie Institution. They form an anatomical publication of unqualified distinction, since all three factors needed for success have fortunately been realized. First, there has been a group of able contributors with beautifully illustrated and important manuscripts; further, there has been generous means for the proper publication of whatever is accepted. Finally, there has been an editor in charge,

whose name does not appear in the title, but whose impress is upon every page. It is not by chance that the great journals of anatomy have been edited by no less distinguished leaders than Max Schultze, His and Virchow. The Carnegie Contributions which thus far rank so well with these are essentially Mall's *Archiv* and one of his worthiest memorials. Even though they are being so ably continued by his junior colleague in the Carnegie Laboratory, who may realize all that Mall had planned, we can not repress deep regret that the work was only well established—scarcely more than begun—when it was left for others to carry on.

Why is the publication so attractive? Possibly because of the absence of "efficiency" methods, so incompatible with scholarly and artistic work. The contributions even appear at irregular intervals when something of moment has been completed and not because it is time for a new issue. There are no rules for preparing standard manuscript, no Procrustean regulation that for every plate there must be so many pages of text, and thanks to the Carnegie Institution, no insulting request that authors of accepted articles pay any part of the cost of publication. If the editor finds a contribution unworthy of a place, he may decline it; but if accepted, it will be fittingly published with the needed figures skilfully and delicately reproduced. And because the editor's judgment is sound, it becomes an achievement to have an article appear in such select company. Probably the *Contributions* shed their enlightening rays in the far corners of the earth, but it is not so announced. The contributor, however, knows for himself that wherever human embryology is studied, these publications will be sought for and treasured.

The series of twenty-six papers thus far published begins auspiciously with Mall's monograph on the fate of the embryo in tubal pregnancy, and Professor Mall has contributed two others—on cyclopia and on the intra-chorionic magma. Professors Van der Stricht and Duesberg, who, during the occupation of Belgium, became the welcome guests of American anatomists, continued here their well-

known investigations. Van der Stricht has written on the genesis and structure of the membrana tectoria and crista spiralis of the cochlea, and Duesberg on "la fécondation des ascidiens"—a study of chondriosomes. Cowdry likewise has dealt with the mitochondrial constituents of protoplasm and has supplied a shorter paper on the chromophile cells of the nervous system. Mitochondria in nerve cells are quantitatively considered by Madge D. Thurlow. The transitory cavities in the corpus striatum are described by Essick. Two papers deal with tissue cultures, the occurrence of binucleate cells being described by Macklin, and the development of connective tissue fibers by Margaret R. Lewis. Miss Sabin, through series of fine injections, strikingly reproduced, has traced the transformation of the posterior cardinal veins of pig embryos, and, in a second paper, the origin of the primitive vessels in the chick. Streeter has advanced the study of the cerebral sinuses, which have been beautifully drawn, and has described also the formation and spread of the periotic tissue spaces. Weed's important work on the development of the cerebrospinal spaces forms the whole of Volume 5. Clark interprets an extraordinary anomaly of the thoracic duct, and Cunningham describes the pulmonary lymphatic vessels of pig embryos. There are three monographic studies of normal human embryos, by Ingalls, Johnson and Watt; and a specimen with spina bifida is described by Miss Wheeler. Corner reports on the corpus luteum in the pig. Meyer has a statistical study of prenatal growth, based on obstetrical records, and Shipley and Wislocki jointly, interested in the chemical products of the poison glands of *Bufo agua*, a tropical toad, describe the histology of these epinephrin-producing glands. In the twenty-sixth and last contribution, Kunitomo deals with the retrogression of the caudal end of the spinal cord and the decline of the tail in human embryos.

The contributions are irregularly grouped in small volumes which are sold separately. Doubtless it would be appreciated if a limited number of the separate articles were offered

to embryologists, though every institution needs the complete file. Altogether it is a journal to be studied by those responsible for our anatomical publications. When the *American Journal of Anatomy* was founded and was being published in Baltimore largely under Mall's direction, it seemed that nothing better was likely to appear in this country. But as the *Journal* became securely established, losing—perhaps we imagine it—the enthusiasm of the earlier volumes, Mall's genius for publications sought new fields. His *Contributions* have caught in beautiful form and permanent record the spirit and purposes of current American investigations in embryology, and their future is full of promise.

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### SPECIAL ARTICLES

#### NOTE ON THE TECHNIQUE OF SOLUTION CULTURE EXPERIMENTS WITH PLANTS

In recent years a large number of sand and solution culture experiments have been carried out by various laboratories. It is becoming recognized that any complete understanding of soil fertility requires an insight into the absorption and metabolism of the plant as well as the nature of the soil solution. In connection with some investigations relating to the latter question, this laboratory has undertaken a series of studies on the effect of concentration and reaction of the nutrient solution on the growth and absorption of the barley plant. Incidental to this work it has been necessary to examine somewhat critically several phases of the technique employed in sand and solution cultures, and it is desired to present here a number of considerations bearing on the interpretation of these experiments.

Ordinarily the conclusions from such investigations have been based on the concentrations and composition of the solutions as originally prepared. In very few cases have analyses been made of the solutions after contact with the plant, nor of the plants themselves. It is not known therefore exactly what was the condition of the solution during the periods between changes. The percentage